Thinking and Being FIT

Can A Computer Think?

“Asking if a computer can think is like asking if a submarine can swim”

- Intelligence could be defined as a property of people
- But computers can do interesting things that people do that seem to take intelligence:
  - Balance a check book and approximate pi
  - Check for spelling errors
  - Type-set documents aesthetically
  - Make medical diagnoses
  - Recognize spoken English over the phone
  - Play and win at games
  - ...

© University of Washington, 2001
Turing Test

- In 1950 A.M. Turing proposed a way for answering the question of whether computers are intelligent
- Strategy: If a person cannot determine through a dialog with a computer and a person which one is the person, then the computer must have some level of intelligence

Revealing Questions

- Are you a person?
- What day is it?
- Who was the first president of the US?
- What is 4410938777327?
- Can white win in 1 move from this chess position …?
- How does Hamlet’s most famous soliloquy start?
- What’s odd about “We all scream for ice cream”?
- What was your father like?
- What is your opinion about impeaching someone for private, personal behavior?
The Challenge of Chess

- Chess is a deterministic game in the sense that it does not involve randomization, such as dice.
- There are a finite number of chess positions, that is, legal arrangements of chess pieces on a board.
- Computers are fast, so enumerate all positions ...

Initial board

White moves

Black moves

A Computer Can Solve Chess, Not

- Exhaustive searching of the chess game tree is impractical.
  - 20 possible initial moves
  - On average there are about 35 moves possible from a given position
  - Typical games are about 100 moves long
- Estimate $35^{100}$ boards in the tree ... there are fewer protons in the entire universe.
  - For a computer to play good chess it needs smarts!
- In the 1960s the pioneers of artificial intelligence -- researchers who study making computers “intelligent” thought that “the day is near when a computer will be the reigning world chess champion”
Game Trees

- How could a computer play chess, if not exhaustively
- A game tree ...

Heuristics are “rules of thumb”

White moves

Black moves

White moves

The Day Came

- Deep Blue, IBM’s chess playing supercomputer was the first computer to win a tournament against the world champion, Gary Kasparov
- Kasparov resigned (in a huff) after 19 moves into the sixth and final game of the match (losing 2.5 to 3.5)

“I tried to play through the rest of the game as best I could, but I lost because [Deep Blue] played great. It played like God.”

Did Deep Blue Exhibit Intelligence?
**FIT 100** The 10 Most Important Topics ...

**Networks**
- Internet, Local Area Network
- TCP/IP and postcard analogy
- Ethernet and conversation analogy
- IP Address, DNS
- Hierarchical domain names
- spiff.cs.washington.edu
- World Wide Web
- HTML, FTP, http://
- Physical/logical separation

**Exposure to Skills**
- Pine
- Netscape and IE
- FTP
- Word
- Excel
- Access
- Search engines
- VB6.0
## What the Digitarati Know

- A human’s innate knowledge of technology
- The perfect GUI: Mac CD Player
- Consistent interfaces
- Standard metaphors
- Standard information processing operations
- Clicking Around
- Blazing Away
- Notice how extensively you used these skills with DBs

Go boldly where you have never gone before

### Computer Basics

- Fetch/Execute cycle and analogy to Nenana Ice Classic
- Five components of a computer
- Memory and container analogy
- Machine instructions and the indirect reference to operands
- Instruction reference via PC
- Memory and speed terminology

Knowing how computers work it should be obvious why they are always so exacting
Algorithmic Thinking

❖ Five basic properties of algorithms
  ❖ Input Specified … like procedure formals
  ❖ Output Specified … like procedure results
  ❖ Effectiveness
  ❖ Definiteness
  ❖ Finiteness … iterations stop
❖ Alphabetize CD’s example
❖ Importance of language in being precise
❖ Difference between algorithms and programs

Topics

- Networks …
- Digitarati …
- Computers …
- Algorithms …
- Programming …
- Logical Reasoning …
- Abstracting …. 
- Databases …
- Deep Ideas …
- Self-reliance …

Alphabetize CDs

Private Sub AlphabetizeCD (slots() As String, n As Integer)
  Dim alpha As Integer, bet As Integer
  Dim temp As String
  alpha = 0
  bet = 1
  Do While alpha < n - 1
    Do While bet < n
      If slots(alpha) > slots(bet) Then
        temp = slots(alpha)
        slots(alpha) = slots(bet)
        slots(bet) = temp
      End If
      bet = bet + 1
    Loop
    alpha = alpha + 1
    bet = alpha + 1
  Loop
End Sub
Programming

- Names, values and variables
- Assignment
- Expressions
- Conditionals
- Procedures with parameters
- Iteration
- Indexing
- VB6 Integrated Development Env

These are a sufficient set of concepts to solve any problem by computer, though there is much more to learn about programming.

Reasoning Exercises

- Worked through as series of problem solving and reasoning situations
  - Binary search algorithm
  - CDC database design
  - Weight Guesser program
  - Inch Worm program
  - Art Work program
  - Body Mass Index program
- Programming exercises
  - Zodiac problems
  - Graphic art program
Abstraction

- On several occasions abstraction was discussed
  - Procedural abstraction
  - Algorithms as more abstract programs
  - Debugging and trouble shooting
  - Testing solutions
- Think abstractly about processes
  - How do things work
  - Am I being as effective with computers as possible
  - Can I apply more or better technology

Topics
- Networks ...
- Digitarati ...
- Computers ...
- Algorithms ...
- Programming ...
- Logical Reasoning ...
- Abstracting ...
- Databases ...
- Deep Ideas ...
- Self-reliance ...

Databases

- Basic structure of relational DBs, including tables, tuples, fields, types
- Forming relationships in DBs
- Queries
- Basics of Access
  - Tables, Forms, Reports
  - Wizards
  - Editing and revising the system

Build a database for your own needs ...
- catalog your books or CDs, address book, help out your club or organization with record keeping
Deep Ideas In Human Thought

- Can computers think
- Who owns your information
- Interpretation of instructions
- Digital representation of information
- Using the intractability of factoring as a means of privacy of information
- Algorithmic thinking and the encapsulation of processes

These issues have not been resolved by or anyone, but key aspects of the ideas have been introduced

You’re On Your Own

- How to find information
- Finding work-arounds to bugs or system incompatibilities
- “Going out and coming back in”
- Extensive experience with contemporary systems
- Reasoning by analogy and example

FIT100’s goal is to initiate you on a life-long learning process, wherein you determine when you need to learn more about IT and then to do so on your own!